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B&Q Cricklewood
ES Volume III

Appendix 10-1: Climate Change Resilience

Montreaux Cricklewood Developments Ltd

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Climate Change Resilience Statement

Introduction

1. The EIA Regulations 2017 (as amended)[1] require an ES to include a statement describing how a Proposed Development will be designed to reduce its vulnerability to future climate change. Consequently, a high-level review of climate change resilience for the Proposed Development has been conducted, which includes all construction and operation of infrastructure and assets associated with the Proposed Development. It covers resilience to both gradual climate change, and an increased frequency of extreme weather events as per the UK Climate Projections 2018 (UKCP18)[2].

2. National and Local Planning Policy requirements pertaining to climate adaptation and resilience are outlined in Section 10.2 of *Chapter 10: Climate Change*

3. Appropriate mitigation measures have been incorporated into the Proposed Development, as summarised below.

Methodology

4. The Climate Change Resilience (CCR) Review comprised:

- Establishing a historic climate baseline. Historic climate data was obtained from the Met Office website[3] as recorded by the meteorological station closest to the Proposed Development (Hampstead);
- Obtaining future climate scenario data for the 25m^2 grid square in which the Proposed Development is located, from UKCP18[4], which provides probabilistic climate change projections;
- Identifying potential impacts to the Proposed Development from climate change; and
- Reviewing resilience and adaption measures described in relevant planning documentation including the Drainage Strategy, Flood Risk Assessment, Outline Energy Assessment and technological considerations in the Design Guidelines.

Baseline Conditions

5. A review of relevant information sources was undertaken to establish existing and future baseline data and current understanding with regards to climate and extreme weather impacts. This section provides detailed information on this data.

Current Baseline

6. The current baseline for the CCR Review is the current climate in the location of the Proposed Development. Historic climate data obtained from the Met Office website[5] recorded by the closest meteorological station to the Proposed Development (Hampstead) for the 30-year climate period of 1981-2010 is summarised in Table 1 below.

Table 1: Historic Climate Data

Climatic Factor	Month	Figure
Average annual maximum daily temperature (°C)		14.3
Warmest month on average (°C)	July	22.4

[1] Her Majesty's Stationery Office (HMSO), 2017; The Town and Country Planning (Environmental Impact Assessment) Regulations 2017
[2] UK Met Office, 2018; UK Climate Projections 2018 (UKCP18). [Online] Available from: http://ukclimateprojections.metoffice.gov.uk/
[3] Met Office, 2019; Historic climate data [Online] Available from https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages
[4] UK Met Office, 2018; UK Climate Projections 2018 (UKCP18).
[5] Met Office, 2019; Historic climate data

Climatic Factor	Month	Figure
Coldest month on average (ºC)	February	1.7
Mean annual rainfall levels (mm)	N/A	704.5
Wettest month on average (mm)	October	77.7
Driest month on average (mm)	February	46.6

7. The Met Office historic 10-year averages for the England Southeast and Central South region identify gradual warming (although not uniformly so) between 1970 and 2019, with increased rainfall. Information on mean maximum annual temperatures (°C) and mean annual rainfall (mm) is summarised in Table 2.

Table 2: Historic 10-year Averages for Temperature and Rainfall for the England Southeast and Central South Region

	Climate Variables	
Climate Period	Mean maximum annual temperatures (°C)	Mean annual rainfall (mm)
1970-1979	13.660	743.93
1980-1989	13.722	761.16
1990-1999	14.398	762.07
2000-2009	14.817	828.73
2010-2019	14.839	798.31

Future baseline

8. The future baseline is expected to differ from the present-day baseline described above. UKCP18 provides probabilistic climate change projections for pre-defined 20-year periods for annual, seasonal and monthly changes to mean climatic conditions over land areas. For the purpose of the assessment, UKCP18 probabilistic projections for pre-defined 20-year periods for the following average climate variables have been obtained:

- Mean annual temperature;
- Mean summer temperature;
- Mean winter temperature;
- Maximum summer temperature;
- Minimum winter temperature;
- Mean annual precipitation;
- Mean summer precipitation; and
- Mean winter precipitation.

9. Projected temperature and precipitation variables are presented in Table 3 and Table 4, respectively. UKCP18 probabilistic projections have been reviewed for the 25km grid square in which the Proposed Development is located. These figures are expressed as temperature/precipitation anomalies in relation to the 1981-2000 baseline.

10. UKCP18 uses a range of possible scenarios, classified as Representative Concentration Pathways (RCPs), to inform differing future emission trends. The RCPs are hypothetical future trajectories modelled on different carbon emission and policy change scenarios and *"… specify the concentrations of greenhouse gases that will result in total radiative forcing increasing by a target amount by 2100, relative to preindustrial levels."* RCP8.5 is the pathway modelled on a business-as-usual scenario and has been used for the purposes of this assessment as the worst-case scenario.

11. As the design life of the Proposed Development is at least 60 years, the CCR Review has considered a scenario that reflects a high level of greenhouse gas emissions at the 10%, 50% and 90% probability levels up to 2079 to review the impact of climate change over as much of the lifetime of the Proposed Development as possible.

Table 3: Projected Changes in Temperature Variables (°C)

Climate Variable	Time Period		
	2020-2039	2040-2050	2060-2079
Mean annual air temperature anomaly at 1.5m (°C)	+1.0 (+0.4 to +1.7)	+1.9 (+0.9 to +2.9)	+3.0 (+1.6 to +4.5)
Mean summer air temperature anomaly at 1.5m (°C)	+1.3 (+0.4 to +2.3)	+2.5 (+1.1 to +3.9)	+3.8 (+1.8 to +6.0)
Mean winter air temperature anomaly at 1.5m (°C)	+0.9 (+0.1 to +1.8)	+1.7 (+0.5 to +2.9)	+2.5 (+0.9 to 4.3)
Maximum summer air temperature anomaly at 1.5m (°C)	+1.5 (+0.2 to +2.8)	+2.7 (+1.0 to +4.7)	+4.3 (+1.7 to +7.0)
Minimum winter air temperature anomaly at 1.5m (°C)	+0.9 (+0.1 to +1.8)	+1.6 (+0.4 to +3.1)	+2.5 (+0.8 to +4.6)

Table 4: Projected Changes in Precipitation Variables (%)

Climate Variable	Time Period		
	2020-2039	2040-2050	2060-2079
Annual precipitation rate anomaly (%)	+2 (-5 to +9)	-1 (-10 to +7)	-2 (-12 to +8)
Summer precipitation rate anomaly (%)	-9 (-30 to +14)	-20 (-47 to +7)	-29 (-59 to +1)
Winter precipitation rate anomaly (%)	+7 (-5 to +21)	+11 (-5 to +30)	+18 (-5 to +43)

12. While these projections represent anticipated average weather conditions, they do not capture the full range of possible future severe weather events (i.e. droughts, heatwaves and prolonged heavy rainfall).

Consideration of Effects

13. The receptors for the climate change resilience review are all aspects of the Proposed Development, including workers, residents, occupiers and associated infrastructure.

Effects During Demolition and Construction

14. During the demolition and construction process, receptors may be vulnerable to a range of climate risks. These could include:

- Inaccessible construction site due to severe weather event (flooding, snow and ice, storms) restricting working hours and delaying construction;
- Health and safety risks to the workforce during severe weather events;
- Unsuitable conditions (due to very hot weather or very wet weather, for example) for certain construction activities; and
- Damage to construction materials, plant and equipment, including damage to temporary buildings/facilities within the site boundary, such as offices, compounds, material storage areas and worksites, for example from stormy weather.

Effects During Operation

15. The key potential climate change impacts on the Proposed Development and the adaptation methods to increase the resilience of the Proposed Development are detailed in Table 5.

Table 5: Potential Climate Changes and Relevant Adaptation Measures

Potential climate changes	Potential impacts on the Development	Adaptation / Resilience measures
Increased frequency and severity of extreme weather events (such as heavy and/or prolonged precipitation, and storm events)	Storm damage to structure and assets. Damage to drainage systems, gutters and downpipes caused by intense rainfall.	The Drainage Strategy[6] outlines proposed resilience features of Sustainable Urban Drainage (SuDs) measures including: • Biodiverse roofs; • Raingardens; • Permavoid geocellular storage; and • Permeable paving. As outlined in Table 5 of the Drainage Strategy, these SuDs have an anticipated attenuation volume of 2,427.7m^3 Chapter 5, Section 5.11 of this ES states that the surface water runoff from the site will be restricted to Greenfield runoff rate using a vortex flow control device and that surface water runoff will be attenuated for 1 in 100 year + 40% climate change event.
Increased winter precipitation	Surface water flooding and standing waters	Resilience measures for increased rainfall are described above.
Increased temperatures and possible heatwaves	Increased temperatures could impact on the structural integrity of materials and assets, and impact the thermal comfort of residents.	The Outline Energy Assessment[7] (section 9.2) describes the proposed design measures to: • Minimise heat generation; • Reduce the amount of heat entering a building in summer; • Manage heat within the buildings through exposed thermal mass and high ceilings; • Provide mechanical ventilation to residential apartments; and • Provide active cooling systems for communal areas. The design has been assessed against CIBSE TM59 Modelling and Analysis Guide[8] for predicting overheating risk in residential building design.
Decreased summer precipitation	Reduced water supply for building users	Section 10.2 of the Outline Energy Assessment describes proposed water efficiency design measures including aerated shower heads and taps, dual flush toilets, and low water consumption appliances.

[6] AECOM, 2020; B&Q Cricklewood Drainage Strategy
[7] Meinhardt, 2019; Cricklewood Lane Outline Energy Assessment, Issue P2 – 08 November 2019
[8] CIBSE, 2017; TM59 Design Methodology for the assessment of overheating risk in homes

Potential climate changes	Potential impacts on the Development	Adaptation / Resilience measures
		Commercial buildings are to be designed to achieve a BREEAM rating of “Very Good.” The need for irrigation water is to be limited by drought resistant landscaped areas, driven by plant choice and planting practices. Rainwater Harvesting has not been included in design plans to date.

Summary and Conclusions

16. The Proposed Development aligns with applicable legislation, national and local planning policy, and UK strategy for the transition to a low carbon economy.

17. To meet with certain requirements of the EIA Regulations 2017, this review has presented how the Proposed Development is designed to reduce its vulnerability to future climate change.

18. A review of relevant information sources was undertaken to establish existing and future baseline data and current understanding with regards to climate and extreme weather impacts.

19. Consideration of the climate change risks and implementation of appropriate adaptation measures, such as those outlined in Table 5, is likely to increase the resilience of the Proposed Development to the impacts of future climate change.